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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/352,976
Filing Date: July 14, 1999
Appellant(s): GILBERT, MICHAEL D.

Steven Frank
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed January 3, 2007 appealing from the Office action mailed August 11, 2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

US 5,441,830	Moulton et al.	8-1995
US 5,565,284	Koga et al.	10-1996

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

I. Claims 1, 5, 6, 8, 9, 14-22, 25, 28, 29 and 68-80 are rejected under 35 U.S.C. 102(b) as being anticipated by Moulton et al. (US 5441830), and evidenced by Koga (US 5565284).

Moulton's invention relates an electrochemical cell. Moulton teaches that it is known that a current collector is attached (adhered) to a cathode or an anode (electrode) in an electrochemical cell to collect current. Typical current collector is a metal foil or a conductive plastic foil (col. 1, lines 35-42). Composite cathodes are well known in the art. For example, a composite cathode can comprise a cathodic material, an electrolytic solvent (electrolyte), an alkali salt, a solid matrix forming polymer. Composite anodes are also well known in the art. For example, a composite anode can comprise an anodic material, an electrolytic solvent, and a matrix forming polymer (col. 8, lines 10-21). Moulton discloses a method for enhancing the adhesion of a composite electrode to a conductive foil by coating the current collector foil with an adhesion-promoter, which retards the contact of the electrolytic solvent in the composite electrode with the current collector (col. 2, lines 20-35). In other words, absence the adhesion-promoter coating, the electrolyte in the composite electrode is in contact with the current collector.

For claims 1, 19 and 20, the well known art of composite electrode, electrolyte solvent, matrix forming polymer, and current collector foil, taught by Moulton, reads on the disbondable composition, electrolyte functionality, matrix functionality, and electrically conductive surface of the instant invention, respectively. Moulton's teaching of a need to enhance the adhesion between composite electrode and conductive foil infers that the adhesion (bonding) is disbondable. Moulton is silent about how a faradaic reaction weakens the adhesion (bonding)

between the composite electrode and current collector foil. However, since the well known electrochemical cell taught by Moulton has the same structure and chemistry as claimed (in the absence of Moulton's adhesion-promoter, the electrolyte in the composite electrode is in contact with the current collector), the bond weakening faradaic reaction at the interface is considered to be inherently present, and this is further evidenced by the disclosure in a Koga reference. Specifically, Koga's invention relates to an electrochemical cell. Koga teaches that when an electrode is formed on a current collector typically in the form of a metal foil, repetition of charge-discharge cycles exacerbates (weakens) the interfacial adhesion (bonding) between the current collector and the electrode, caused by the expansion and contraction during doping and dedoping of the active material upon charging and discharging (i.e., electrochemical or faradaic reactions; see also specification page 4, lines 18-19, which defines "faradaic reaction" as "electrochemical reactions in which a material is oxidized or reduced"), which creates defects (debonding) at the electrode-current collector interface, and by the decomposition of the polymer binder by oxidation and reduction (electrochemical or faradaic reactions) upon charging and discharging (col. 1, lines 39-60). It should be noted that a sufficient amount of electrolyte is necessarily present at the electrode-current collector interface for carrying out the ionic electrochemical or faradaic reactions.

For claims 5, 6, 8, 9 and 14-16, Moulton teaches that the cathode paste can optionally contain film forming agents such as polypropylene oxide, which reads on the recited alkoxy moieties (col. 12, lines 36-44). Suitable electrolytic solvents include propylene carbonate, ethylene carbonate (alkyl carbonates), glyme (alkoxide), etc. (col. 7, lines 33-35). Suitable cathode prepolymers are metal ion conducting, such as propylene oxide, ethylene oxide,

epichlorohydrin (epoxies), acrylol-derivatized polyethylene oxide, urethane acrylates, vinyl sulfonate polyalkylene oxides, etc. (col. 5, line 59 through col. 6, line 5; col. 12, lines 26-35). Among the exemplary prepolymers, the vinyl sulfonate polyalkylene oxides comprises both a non-polar component (polyalkylene oxide segment) and an ionic conductive component (vinyl sulfonate segment). Further, the polyalkylene oxide non-polar component also reads on the instantly claimed alkoxy moieties. As to the recited localized phases of regions of substantially matrix functionality and substantially electrolyte functionality, since the prior known art employs the same matrix forming polymers and electrolytes as claimed, and the compatiblility among materials is an inherent material property, these compatibility related regions are also deemed as being inherent.

For claims 17, 18 and 21, since applicant either failed to traverse the Examiner's assertion of official notice, or the traverse was inadequate (see Office action mailed 2/28/2003, pages 4-5; and Office action mailed 7/22/2004, page 5), these limitations have been taken as admitted prior art.

For claim 22, Moulton teaches in Example 7 that the cathode powder is prepared by combining V_6O_{13} and carbon powder, and V_6O_{13} is prepared by heating ammonium metavanadate ($NH_4^+VO_3^-$), i.e., an ammonium salt, (col. 18, lines 57-61).

For claim 25, Moulton shows in Example 7 a cathode paste composition comprising an inhibitor (col. 19, line 32-33).

For claim 26, Moulton teaches that the composite electrode in an electrochemical cell of prior known art is adhered to current collector foil, therefore the composite electrode composition functions as an adhesive to the foil.

For claim 28, Moulton teaches that the electrode is applied by coating method (col. 13, lines 19-23).

For claim 29, absence of a standard of what constitutes "resistant to delamination", the prior art reads on the instant invention as claimed.

For claim 68, the composite electrode and conducting foil in an electrochemical cell are inherently connected to separate conducting poles (a positive pole and a negative pole), and supports an electrochemical (faradaic) reaction at the bond between the composite electrode and current collector upon charging-discharging cycles, as evidenced by Koga.

For claims 69-79, since the claimed limitations essentially duplicate the same scope of the preceding claims, they are also rejected as set forth above.

For claim 80, Moulton teaches a layer of electrically-conducting adhesion promoter comprising a polymeric matrix of from about 20 to about 70 weight percent of a polymer derived from solid matrix forming monomer or partial polymer thereof (col. 3, lines 24-29; lines 39-43 and 64; col. 4, line 6). While Moulton teaches that the adhesion promoter retards the contact of electrolyte to the current collector, his teaching does not exclude the presence of electrolyte at interface. In other words, the claimed invention does not preclude the teaching of Moulton.

II. Claims 4, 23, 24, 30, 32, 66 and 67 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Moulton et al. (US 5441830), and evidenced by Koga (US 5565284).

The teachings of Moulton are again relied upon as set forth above.

For claim 4, Moulton teaches that conventional curing or crosslinking is used for forming a solid electrode (col. 13, lines 29-38). While Moulton is silent about crosslinking densities in

various regions, since the known art has substantially the same structure, composition and electrochemistry as the instant invention, suitable varied crosslinking densities in various regions are deemed to be either inherent to the regional compositions, or an obvious routine optimization to one skilled in the art of composite electrode, motivated by the desire to obtain improved mechanical strength.

For claims 23 and 24, Moulton is silent about the ionic conductivity of the composite electrode. However, since the known art has substantially the same structure, composition and electrochemistry as claimed, a suitable ionic conductivity is also deemed to be either anticipated, or an obvious routine optimization to one skilled in the art of composite electrodes, motivated by the desire to obtain a good electrical current.

For claims 30, 32, 66 and 67, Moulton is silent about the shear strength of the adhesive bond. However, since the known art has substantially the same structure, composition and electrochemistry as claimed, and Moulton also teaches that an enhanced adhesion is desired, a suitable shear adhesion strength is deemed to be either anticipated, or an obvious routine optimization to one skilled in the art of electrochemical cells, motivation by the desire to obtain a durable adhesion between the electrode and current collector.

(10) Response to Argument

Appellant contends at pages 5-8 that nothing in Moulton or Koga is even remotely relevant to the claimed invention, because 1) while Moulton teaches methods for enhancing the adhesion, Moulton contains no suggestion that adhesion is affected by any electrochemical process at the boundary; 2) Moulton implicitly teaches that metal foil current collectors do not suffer from any "inherent, bond-weakening" process, and throughout the specification Moulton

refers to plastic foil current collectors and there is no suggestion by Moulton that his "adhesion promoter" would provide any benefit to metal foil current collectors. However, regarding item 1), while Moulton is silent about how a faradaic reaction weakens the adhesion (bonding) between the composite electrode and current collector foil, Moulton's teaching of the need of an adhesion promoter to retard the contact of the electrolytic solvent in the composite electrode with the current collector infers that the adhesion (bond) at interface weakens (disbondable) over electrochemical (faradaic) reactions during battery use. Further, since the well known electrochemical cell taught by Moulton has the same structure and chemistry as claimed (in the absence of Moulton's adhesion-promoter, the electrolyte in the composite electrode is in contact with the current collector), the bond weakening faradaic reaction at the interface is deemed to be inherently present, which is further evidenced by the disclosure in Koga's reference. Regarding item 2), Appellant is reminded that the independent claims of present invention merely recite "electrically conductive surface", therefore regardless whether Moulton teaches a metal foil or a conductive plastic foil, Moulton's disclosure reads on the instant invention as claimed, and appellant's remarks appears to be pointless. Further, Moulton teaches that typical current collector is a metal foil or a conductive plastic foil, and nowhere has Mouton implicitly disclosed that metal foil current collectors do not suffer from bond-weakening process and his adhesion promoter is limited for use with plastic foil. Appellant appears to analyze the prior art disclosures in vacuum, and the remarks are clearly contrary to the evidence provided in Koga reference, in which only metal foils are discussed.

Appellant argues at pages 8-10 that the declaration of A.C. Makrides shows that a composite electrode is not electrochemically disbondable from its current collector via faradic

reaction at the interface because the electrode is necessarily an electronic conductor, therefore it cannot support a potential difference at the interface which is crucial for a faradic reaction. Appellant also makes conclusive remarks that Koga's bond weakening reaction (caused by various electrochemical reaction related effects, such as mechanical defects and oxidative decomposition, etc.) is not a faradic reaction at the interface. However, Makrides fails to provide any explanation why the conductivity of an electrode necessarily cannot support a faradic reaction at the interface between electrode and current collector. To the contrary, although appellant has acknowledged that Koga has correctly described interfacial bond weakening (disbonding) between electrode and conductive foil as being caused by charge-discharge cycle related effects, which are necessarily oxidative electrochemical (faradic) reactions, but appellant has simply ignored the fact that Koga's electrode is necessarily an electronic conductor as well, therefore Makrides' opinion is not credible. Appellant's dismissal that Koga' bond weakening reaction is not a faradic reaction ignores the prior art disclosures, and is without basis and therefore unpersuasive.

Appellant argues at pages 10-11 that the present claims cover compositions with specific electrical properties (disbonding by a faradic reaction) that are lacking in Moulton's compositions, because Moulton teaches composite electrodes which are electronic conductor, whereas the faradic reaction of the present invention cannot be supported by an electronic conductor. However, while Moulton and instant invention are directed to different end use, appellants are reminded that since Moulton teaches the same composition as claimed, their electrical properties, including disbonding properties, must be inherently the same. Further, appellant appears to indicate the composition of instant invention is not an electronic conductor,

such a statement is clearly incommensurate with the claimed composition which requires the property of "sufficient ionic conductivity" (see independent claims).

Appellant argues at page 11 that the examiner attempts to refute the notion that Moulton teaches an electronic conductor. However, the examiner has simply pointed out that in addition to being electronic conductors, Moulton's composite electrodes comprise cathodic or anodic materials for electrochemical reactions to generate current, nowhere has the examiner stated that Moulton's electrodes are not electronic conductors.

Appellant argues at page 12 that the present claims do not recite a composite electrode. However, while Moulton and instant invention are directed to different end use, appellants are reminded that Moulton teaches the same composition as claimed, even it is contemplated for a different use.

Pointing to prior Office action dated 8/26/05, appellant argues at pages 12-14 that the examiner has either ignored the critical claim limitations or misread the prior art, because the examiner indicated that applicant has failed to point out any distinct structure and/or composition features in the claim to preclude the prior art. After a careful review of prior Office actions, the examiner stands by the above statement that a patentable distinctive feature is not found in the invention as claimed.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Victor Chang

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